Project B-209

PISTONS, PISTON RINGS, AND VALVES

A Manufacturing Opportunity in Georgia

Prepared for

The Georgia Department of Industry and Trade
Jack Minter, Director
100 State Capitol
Atlanta, Georgia

by

Harvey Diamond

Industrial Development Division
Engineering Experiment Station
GEORGIA INSTITUTE OF TECHNOLOGY
June 1964

Table of Contents

Summary

A Georgia branch plant for the manufacture of pistons, piston rings, and valves, serving the southeastern market with an output of $2 million annually, could effect savings equivalent to an additional profit of between $45,000 and $168,000.

The value of pistons, piston rings, and valves consumed in the Southeast[1/] was $19 million in 1962. The demand for these automotive parts should reach $24 million worth by 1970.

In 1958 Atlanta companies distributed over 13% of all the automotive equipment wholesaled in the southeastern area.

A Georgia manufacturer producing pistons, piston rings, and valves for the southeastern market can realize considerable savings not available to existing midwestern suppliers to the area. They are:

1. Labor Savings. A Georgia manufacturer can produce $2 million worth of pistons, piston rings, and valves for $26,000 to $145,000 less than in Missouri, Indiana, or Michigan.
2. Freight Savings. A Georgia manufacturer can deliver $2 million worth of pistons and parts to customers in the Southeast at a transportation cost of $18,000 to $23,000 less than is possible from existing midwestern plants.

In addition, a Georgia manufacturer of pistons, piston rings, and valves can anticipate high productivity, a low work stoppage record, speedy delivery facilities to the southeastern market, reduction of warehousing needs, smaller inventory requirements, and broader distributor representation.

1/ Alabama, Florida, Georgia, North Carolina, South Carolina, and Tennessee.

INTRODUCTION

The purpose of this study is to determine the practicality of manufacturing automotive pistons, piston rings, and valves in Georgia for consumption in the Southeast by enumerating and comparing the advantages such a manufacturing operation could command over present suppliers to the southeastern area.

The largest portion of replacement "hard parts" (a trade term used for engine and chassis parts) marketed in the Southeast is manufactured in the Midwest. (See Map 1.)

The principal purchasers of these parts are:

1. wholesale distributors of automotive parts,
2. service departments of new car dealers,
3. mail order and retail outlets, and
4. engine rebuilders.

Manufacturers usually ship to customers from branch warehouses at the purchasers' expense. If a manufacturer does not have a branch warehouse, orders are shipped prepaid from the plant.

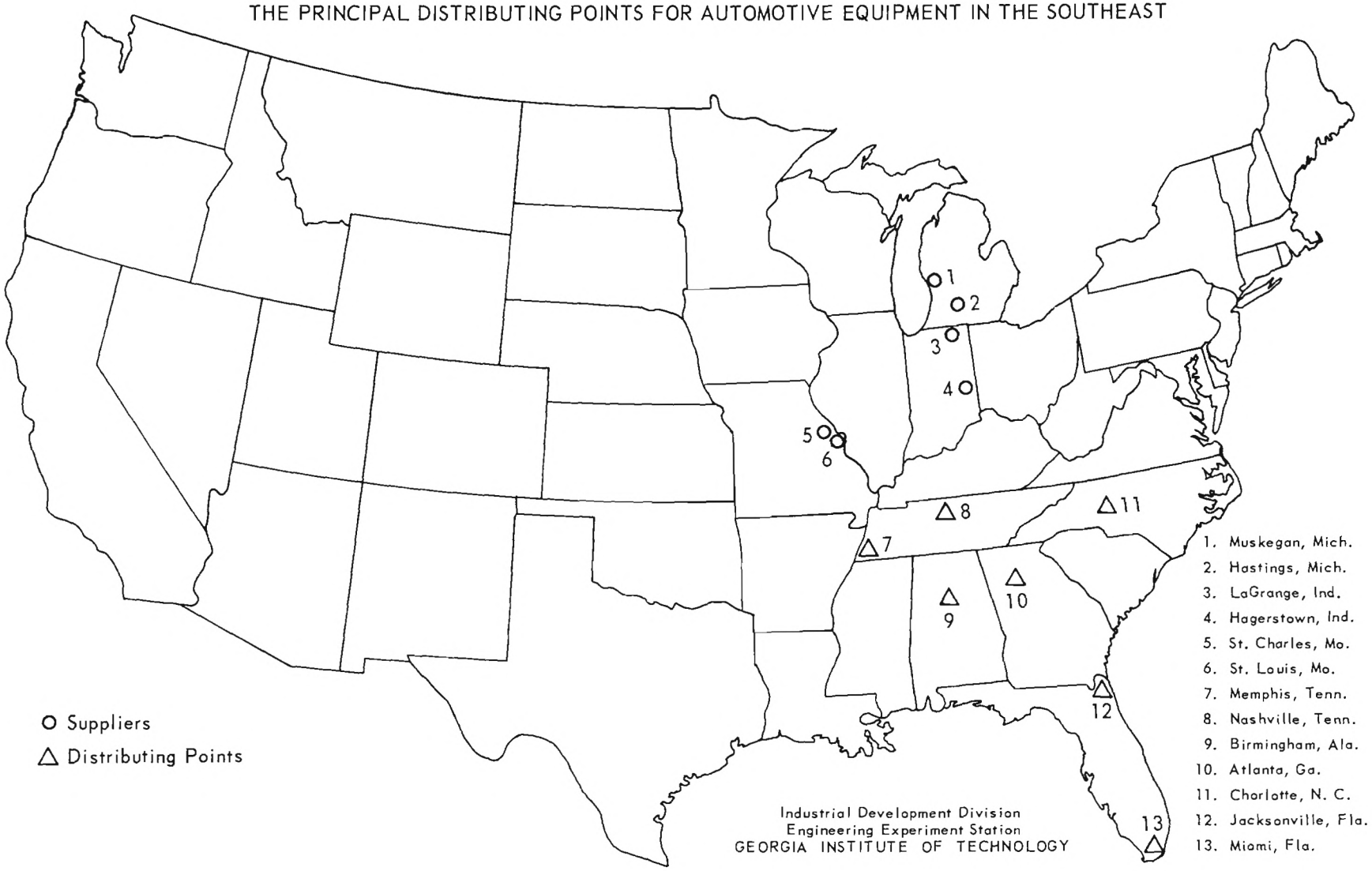
Since the marketing of piston rings (the largest volume item in hard parts) is highly competitive because of wide interchangeability between brands, special inducements from the manufacturer prevail throughout the industry. They are:

1. volume rebates,
2. returned goods privileges,
3. consignment of stock,
4. technical assistance,
5. trade promotions,
6. missionary selling, and
7. training schools for mechanics.

Although a turbine-driven car may be produced in the near future, it is doubtful whether its appearance will appreciably affect the replacement market for pistons, piston rings, and valves in 1970.

MAP 1

LEADING SUPPLIERS OF PISTONS, PISTON RINGS, AND VALVES TO THE SOUTHEAST AND THE PRINCIPAL DISTRIBUTING POINTS FOR AUTOMOTIVE EQUIPMENT IN THE SOUTHEAST



MARKETS

National Market for Automotive Parts

National sales of automotive replacement parts and accessories totaled $2.60 billion in 1962. This represents an increase of 55% over the 1954 figure of $1.67 billion.

By using the years from 1954 through 1962 as a basis for a first-degree projection, it is estimated that the market for automotive replacement parts will be $3.41 billion in 1970. (See Figure 1.)

Southeastern Market for Pistons, Piston Rings, and Valves

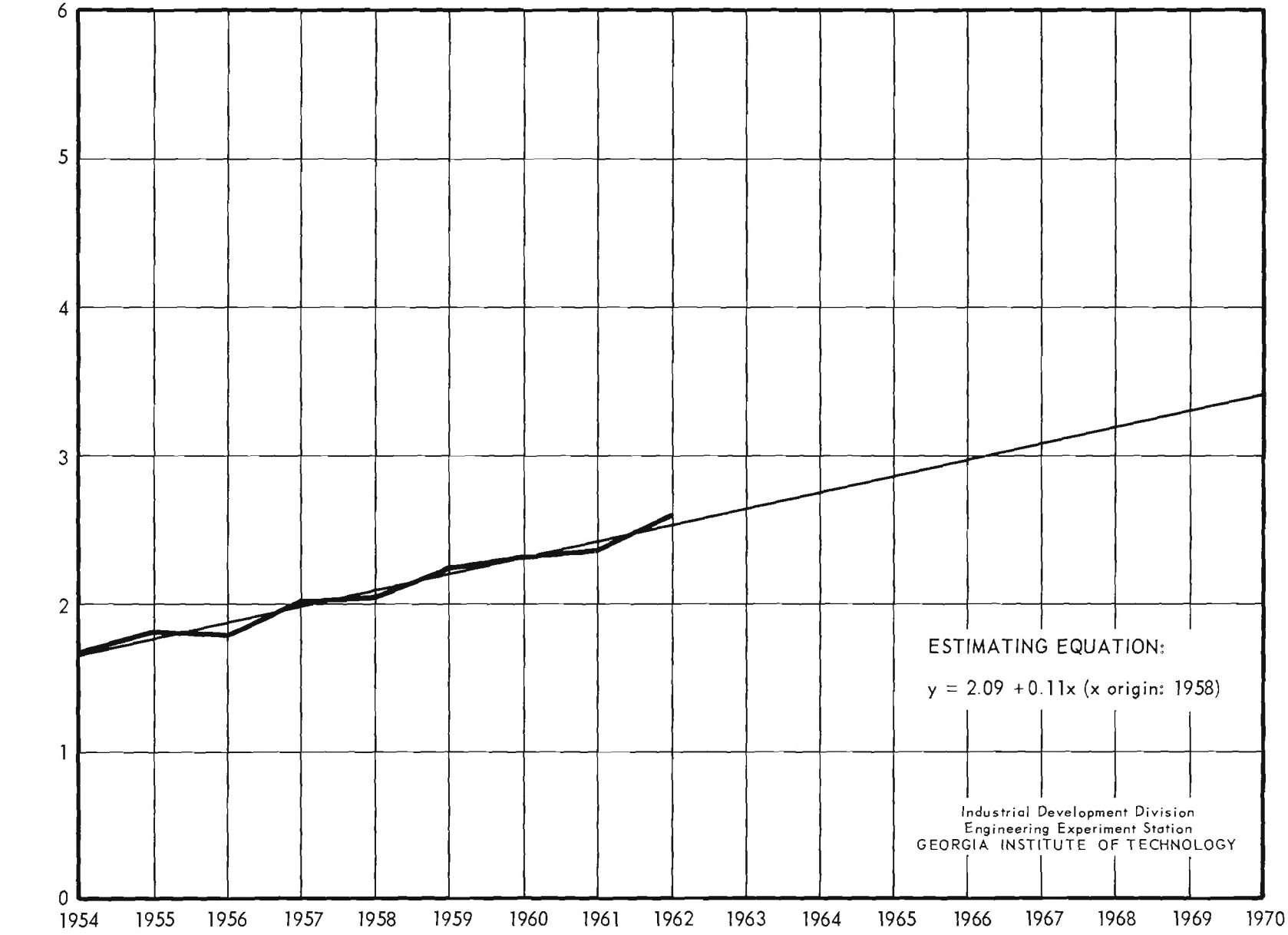
Since automotive replacement parts are most frequently installed in used cars, it is not surprising to find an extremely high coefficient of correlation (0.97) between automotive replacement parts sales and registered automobiles more than three years old. (See Appendix 1.)

The Southeast's[1/] proportion of registered automobiles more than three years old in the United States has remained comparatively constant for a number of years. (See Table 1.) Since the registration of these used cars in the Southeast is approximately 12% of the national registration of similarly aged automobiles, it can be assumed that, because of the aforementioned high correlation, the southeastern market for automotive parts is approximately 12% of the national market. This assumption would place automotive parts sales in the Southeast at $312 million in 1962 and at $409 million in 1970.

Automotive parts wholesalers in the area calculate their expenditures for pistons, piston rings, and valves to be 6% of the total purchase cost for parts and accessories. This would indicate that sales of pistons, piston rings, and valves in the Southeast were nearly $19 million in 1962. By 1970 the demand for these hard parts in the southeastern area should be approximately $24 million worth.

1/ Alabama, Florida, Georgia, North Carolina, South Carolina, and Tennessee.

FIGURE 1
SALES TREND OF AUTOMOTIVE PARTS AND ACCESSORIES



SOURCE: Automotive Facts and Figures, 1963

Table 1

COMPARISON OF REGISTERED MOTOR VEHICLES
MORE THAN THREE YEARS OLD
IN THE SOUTHEAST AND THE U. S.

Year	Number of Vehicles Registered (in thousands)		Southeastern Percentage of U. S.
	Southeast	U. S.	
1954	3,452	32,267	10.7
1955	3,532	32,405	10.9
1956	3,816	34,460	11.1
1957	4,005	35,130	11.4
1958	4,376	37,730	11.6
1959	4,806	40,834	11.8
1960	5,073	42,750	11.9
1961	5,108	42,880	11.9
1962	5,310	44,446	11.9

Source: Automotive Industries, Statistical Issues, 1955-1963

Wholesale Sales of Automotive Parts in the Southeast

In 1958 over $3.85 billion worth of new automotive parts and accessories were distributed nationally through automotive equipment wholesalers (the principal distributors of automotive parts).[1/] Of this volume, $472 million, or 12.2%, were sold by wholesalers in the southeastern area. This percentage is comparable with the Southeast's portion of registered automobiles more than three years old.

Seven cities, led by Atlanta with 13%, wholesaled over 51% of the automotive equipment (all types of operations) distributed in the Southeast. Each of these cities, with wholesale sales volume and a comparative proportional value, is shown in Table 2.

1/ U. S. Bureau of the Census, 1958 Census of Business -- Wholesale Trade.

Table 2

WHOLESALE SALES OF AUTOMOTIVE EQUIPMENT
IN LEADING DISTRIBUTION CITIES IN THE SOUTHEAST
(1958)

City	Wholesale Sales (in millions of dollars)	Percentage of Total Sales in Seven Cities
Atlanta, Ga.	78.9	26
Jacksonville, Fla.	46.6	15
Memphis, Tenn.	43.1	14
Charlotte, N. C.	38.0	13
Birmingham, Ala.	35.8	12
Nashville, Tenn.	31.6	10
Miami, Fla.	29.4	10
	303.4	100

Source: U. S. Bureau of the Census, 1958 Census of Business -- Wholesale Trade

Since Atlanta has 70% more wholesale sales than the southeastern city with the next largest sales volume, a company planning a market-oriented plant will find Georgia a logical location.

ADVANTAGES OF A GEORGIA LOCATION

There is an established market for pistons, piston rings, and valves in the Southeast. Automotive parts for this market are manufactured by plants in the Midwest and are shipped into the six-state southeastern area by truck.

A hard parts manufacturer in Georgia can supply and service the southeastern market more efficiently and economically than existing producers because of the following factors:

1. higher productivity,
2. labor savings,
3. low work stoppage,
4. freight savings,
5. faster delivery time,
6. reduced warehouse facilities,
7. decreased inventory, and
8. increased representation.

Higher Productivity

A Georgia manufacturer of nonelectrical machinery can realize a greater return for each wage dollar spent than can a manufacturer in Indiana, Michigan, or Missouri producing the same class of products. Value added per wage dollar can be determined by dividing the value added by manufacture by production wages.[1/] These values for the above states are:

Georgia	$3.08
Missouri	$2.90
Indiana	$2.78
Michigan	$2.29

Labor Savings

Production labor costs can be calculated by dividing the value added for any given annual sales volume by the value added per wage dollar. In 1958 the national value added by manufacture for machine shop products equaled 64.8% of the national value of shipments. For a plant producing $2 million worth of

---

1/ U. S. Bureau of the Census, 1958 Census of Manufactures, Volume III, Area Statistics.

pistons, rings, and valves, the value added by manufacture would be $1,296,000 and the production labor costs would then be:

Michigan	$1,296,000	÷	$2.29	= $566,000
Indiana	$1,296,000	÷	$2.78	= $466,000
Missouri	$1,296,000	÷	$2.90	= $447,000
Georgia	$1,296,000	÷	$3.08	= $421,000

The above figures indicate that a manufacturer in Georgia producing $2 million worth of pistons and parts can anticipate the following production labor cost savings over plants located in the Midwest:

Georgia over Michigan	$145,000
Georgia over Indiana	$ 45,000
Georgia over Missouri	$ 26,000

Low Work Stoppage

Georgia has a lower work stoppage rate than any state presently producing pistons and piston rings for the southeastern market. During 1962 the proportion of work stoppage time to total working time in Georgia was 71% less than in Michigan, 69% less than in Indiana, and 33% less than in Missouri.[1/]

Freight Savings

Four of the major suppliers of piston rings to the Southeast have one or more branch warehouses in the region. Each of the four companies has a branch warehouse in Atlanta. Since most customer shipments by these firms are made from the warehouses (at the buyers' expense), a piston ring manufacturer who presently has a southeastern branch warehouse could save the freight cost from the Midwest to the southeastern market by establishing a manufacturing facility in Georgia. Freight rates are shown in Appendix 2.

Based on an average value of $2.00 per pound for piston rings, a manufacturer producing $2 million worth of these products annually will ship during the course of a year 45 truckloads. By multiplying the freight rates to Atlanta by the size of the truckload and then by the number of truckloads shipped annually, the annual freight cost from each manufacturing city can be determined. (See Table 3.)

1/ U. S. Department of Labor, 1962 Statistical Supplement -- Monthly Labor Review.

Table 3

ANNUAL FREIGHT COSTS FOR SHIPPING PISTON RINGS TO ATLANTA
(Based on annual shipments of $2 million)

City	Freight Rate to Atlanta (per 100 lbs.)		Size of Truckload (in 100 lbs.)		Number of Truckloads		Annual Freight Cost
LaGrange, Ind.	$2.14	x	220	x	45	=	$21,100
St. Louis, Mo.	1.99	x	220	x	45	=	19,700
Hagerstown, Ind.	1.85	x	220	x	45	=	18,300

These calculations would indicate an annual freight saving of $18,000 to $21,000 on sales of $2 million.

Suppliers without a branch warehouse in the Southeast would save slightly more, because some shipping destinations are farther from the manufacturing plant than Atlanta. If it is assumed that freight rates to Atlanta are average for the southeastern market, the annual freight costs on sales of $2 million for present manufacturers in St. Charles, Missouri, Hastings, Michigan, and Muskegon, Michigan, would be $21,600, $22,200, and $23,200, respectively.

Mill shapes and forms and castings, the principal raw materials used for manufacturing pistons, piston rings, and valves, are readily available in Georgia. Aluminum and aluminum-base alloy mill materials are shipped prepaid with transportation costs absorbed by the mill.

Faster Delivery Time

A Georgia producer of piston rings can offer customers in the Southeast quicker delivery service than can a midwestern manufacturer operating without the benefit of a branch warehouse. Excellent motor transportation facilities available to a Georgia manufacturer can reach most southeastern points with one-day delivery service. From a plant in the Midwest similar deliveries would take two days.

Reduced Warehouse Facilities

The primary purpose of a branch warehouse is to afford greater product availability to distributors. This holds true both for popular quick-turnover merchandise and for slow-moving items which are not stocked by the wholesaler.

A piston, piston ring, and valve manufacturing operation in Georgia would eliminate the need for a supplier to have a branch warehouse in Atlanta.

Decreased Inventory

A manufacturer of piston rings in Georgia can, by his proximity to the southeastern market, offer customers greater and more extensive product availability. Consequently, the need for broad stock consignment would be diminished. By decreasing stock consignments and eliminating the necessity for a branch warehouse, inventories can be reduced and the most efficient scheduling of production may be arranged.

Increased Representation

Branch warehouses serve to limit the number of wholesale distributors carrying a particular line because they are directly competitive with the wholesaler. With the elimination of the branch warehouse, the tendency for distributors to promote products of a local manufacturer would be heightened by increased noncompetitive product availability. This additional distributor backing would provide a Georgia manufacturer with greater area coverage than producers depending upon branch warehouse sales can maintain.

CONCLUSION

The southeastern market for pistons, piston rings, and valves is presently supplied and serviced by plants in the Midwest.

A piston, piston ring, and valve producer located in Georgia can satisfy this market more profitably than any current supplier due mainly to substantial savings in production costs.

A hard parts manufacturer located in Georgia and selling to the southeastern market also has the advantages of fast delivery service at a low freight cost, high labor productivity with a low work stoppage ratio, reduction of warehouse and inventory requirements, and increased area representation.

A Georgia manufacturer producing $2 million worth of pistons, piston rings, and valves for consumption in the Southeast can save from $45,000 to $168,000 in labor and freight costs over present manufacturers serving the same area. These savings are equal to an extra profit on sales of 2.2% to 8.4%.

APPENDICES

Appendix 1

CORRELATION BETWEEN AUTOMOTIVE REPLACEMENT PARTS
AND MOTOR VEHICLE REGISTRATIONS OF AUTOMOBILES
MORE THAN THREE YEARS OLD

Year	X	Y	x (X-A)	y (Y-A)	xy	x^2	y^2
1954	167	323	-42	-58	2436	1764	3364
1955	181	324	-28	-57	1596	784	3249
1956	178	345	-31	-36	1116	961	1296
1957	201	351	- 8	-30	240	64	900
1958	204	377	- 5	- 4	20	25	16
1959	225	408	16	27	432	256	729
1960	231	428	22	47	1034	484	2209
1961	236	429	27	48	1296	729	2304
1962	260	444	51	63	3213	2601	3969
Sum	1883	3429			11383	7668	18036
Average (A)	209	381					

Number (N) = 9

$$\sigma_x = \sqrt{\frac{\Sigma x^2}{N}} = \sqrt{\frac{7668}{9}} = \sqrt{852} = 29$$

$$\sigma_y = \sqrt{\frac{\Sigma y^2}{N}} = \sqrt{\frac{18036}{9}} = \sqrt{2004} = 45$$

$$\text{Coefficient: } r = \frac{\Sigma xy}{N\sigma_x\sigma_y} = \frac{11383}{9(29)(45)} = \frac{11383}{11745} = 0.97$$

X = Automotive replacement parts

Y = Motor vehicle registrations of automobiles more than three years old

Appendix 2

TRUCKLOAD FREIGHT RATES FOR PISTON RINGS
(in cents per 100 pounds)

	FROM:						
TO:	Atlanta Ga.	Hagerstown Ind.	Hastings Mich.	LaGrange Ind.	Muskegon Mich.	St. Charles Mo.	St. Louis Mo.
Atlanta, Ga.	38	185	224	214	234	218	199
Birmingham, Ala.	66	185	225	208	231	189	173
Charlotte, N. C.	103	199	240	231	249	254	238
Jacksonville, Fla.	120	245	278	268	288	269	253
Memphis, Tenn.	149	177	205	195	210	153	137
Miami, Fla.	172	299	331	321	341	326	302
Nashville, Tenn.	126	146	182	169	192	158	142

Note: Rates are based on a minimum truckload weight of 22,000 pounds.